Exploring the Moon and Meteorite Mysteries

Teacher Workshop

February 23, 1999

Overview of Workshop

- Introductions
- Exploring the Moon
  - background info, video, demo, hands-on
- Morning break
- Certification
- Lunch
- Meteorite Mysteries
- Afternoon break
  - background info, video, demo, hands-on
- How to Access NASA Materials and Services
- Evaluation

Exploring the Moon

- About this book
  - Certification and Loan Program
  - Background information p. 1-16
  - Fact sheets of moon and rocks
  - Divided into three units
  - Glossary of bold words

The Moon

- Why do we study the Moon?
- How were the Earth and Moon formed?
- Is the Earth changing?
- Does the Moon change its size in the sky?
- What features are the same?
- What features are different?
- Why are temperatures on the Earth and Moon so different?

Apollo Missions

- Six missions landed astronauts (11, 12, 14, 15, 16, 17)
- Returned 382 kilograms of rock and sediment
- More than 2,000 samples
- 12 Astronauts
- 1969-1972

Moon Facts

- No atmosphere
- Very small moonquakes (one per year)
- Smaller core than Earth
- Thicker crust than Earth
- Weak magnetic field

The Lunar Landscape

Studied by Thomas Hariot and Galileo Galilei with telescopes, later studied by Kepler

- Volcanic activity
  - after highlands formed
  - after most of the creatoring
- Highlands- lunar terrae (Latin for land)
- Dark plains- lunar maria (Latin for seas)
  - 16% of surface
  - lava flows in low lying areas
  - younger than highlands and basins
- Craters formed by meteorite impacts

Meteorite Impact

- When the meteor hits it traveling at 70,000 km/hour
- High-pressure waves between the impactor and the planet
- Transfer of energy
- impactor vaporizes
- target is compressed then decompressed, vaporized and melted
- A mass 10,000 times the mass of the impactor is piled up around the hole so produced
- Crater- bottom is lower than original surface, rim is higher

Lunar Surface

- Meteorite impacts have ground up the surface into powder
- Rocks strewn about the surface
- Lunar regolith- gray powder
- No soil- refers to organic mater

Moon Rocks

- To determine mineral and chemical composition
- To determine ages
- Mostly igneous

What’s Next?

- Scientists are still working with the rocks returned by the Apollo Missions
- New techniques
- Increased understanding

The Moon’s Origin

- An object the size of Mars hit Earth
- The explosion sent heated material into Earth orbit
- The Moon formed from the debris
- 4.5 Billion years ago (same as Earth)

Unit 1 Pre-Apollo

Scale Models and Rock Observations

- Any globe
- Basket ball and tennis ball
- Rock Chart p.36 (one per person)
- Basic rock identification (curriculum)

Unit 2 Learning from Apollo

Observation of Disc

- The Lunar Disk
  - pass out p. 41-42 (one per person)
- Impact Craters
  - p.62
  - choose a group recorder
  - pass out p. 66-69 (one per group)

Unit 3 The Future

Responsible Land Use

- Read scenario p. 103
  - life support, communications, air supply, electricity, food, recreation, waste management, water supply, transportation
- Identify team member tasks

Lunar and Meteorite Loan Certification

- Six samples of rock and regolith
- 15-cm diameter plastic disc
- Registered mail
- One or two week loan periods
- Written request, one month prior
- Must be certified

Lunch

Exploring Meteorite Mysteries

Meteorites

- Rocks from space that land on Earth
- Give us clues to the origin of the Solar System
- Made up of a variety of minerals (natural crystalline materials)
- Classified by their mineralogy and composition
- Most come from asteroids
- Can come from; comets, Moon, Mars

Meteors

- Bright streaks in the sky
- fire balls
- Meteor showers

Don’t get confused...

- Asteroid- large chunk of rock that orbits the Sun, between Mars and Jupiter.
- Comet- a small body of dust and gas, tail points away from sun

Lesson 1- Noblesville Fall

- Page 1.1
- Introduction
- Story
- Predictions
- Pictures

Lesson 5 - Sample Disk

- Page 5.3
  - four stations
- Descriptions of Meteorites in the disk
  - Page 30

Lesson 8 - Edible Rocks

- Page 8.1
- Make the observable connections to the familiar
- Pass out student sheet 8.5
- Draw and describe- use field terms
  - the outer layer is a thin coat of brown materials with cream or tan colored chunks